

REMARKS

Reconsideration of the application is requested in view of the modifications above and the remarks below. In response to the previous Office Action's comments regarding new matter, Applicants have modified Claim 10 to indicate address the situation that the pH ranging from about 2 to about 6 occurs at 22 °C.

1. **Rejection Under 35 USC 112, first paragraph**

The Office Action rejected Claims 10-15 under 35 USC, 112, first paragraph, on the grounds that the specification only provides support for this pH at a temperature of 22 °C. This rejection is unwarranted.

35 USC 112, first paragraph, provides, in part, that the "specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same."

Applicants' invention relates to a method that involves polishing a composite material containing silica and silicon nitride with an acidic polishing slurry comprising: (a) from about 0.1 to about 3.5% , by weight, of a colloidal silica abrasive, (b) from about 1 to about 6%, by weight, of a fluoride salt, and (c) wherein if the slurry has a temperature of 22 °C, the slurry has a pH ranging from about 2 to about 6.

As currently written, the application provides support for the claim. The instant specification contains a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the claimed invention. Reconsideration is requested.

OBJECTIONS

The Office Action objected to the specification on the grounds that the continuing data did not define the status of the parent application. In view of the modifications above, the objection is believed overcome. Reconsideration is requested.

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On page 1, please insert:

--This application is a divisional of U.S. Serial No. 10/023,174, filed December 17, 2001, now abandoned.--

2. Rejection of Claims 10-15 Under 35 USC 112, first paragraph

The Office Action rejected Claims 10-15 under 35 USC 112, first paragraph, on the grounds that the limitation "wherein the slurry has a pH ranging from about 2 to about 6," introduced new matter, because the specification allegedly provided support for this pH at a temperature of 22°C. In view of the modifications to Claim 10, the rejection is believed overcome. The current language addresses the situation where if the slurry has a temperature of 22 °C, the slurry has a pH ranging from about 2 to about 6. Reconsideration is requested.

3. Rejection Under 35 USC 103

A. Rejection of Claims 10-15 under 35 USC 103 over either EP 1077241 or U.S. Pat. No. 6,471,735 (Misra)

The Office Action rejected Claims 10-15 under 35 USC 103 over either EP 1077241 or U.S. Pat. No. 6,471,735 (Misra).

The rejection should be withdrawn. It is well settled that to establish a *prima facie* case of obviousness, the USPTO must satisfy all of the following requirements. First, the prior art relied upon, coupled with the knowledge generally available in the art at the time of the invention, must contain some suggestion or incentive that would have motivated the skilled artisan to modify a reference or to combine references. *In re Fine*, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988). Second, the proposed modification must have had a reasonable expectation of success, as determined from the vantage point of one of ordinary skill in the art at the time the invention was made. *Amgen v. Chugai Pharmaceutical Co.* 18 USPQ 2d 1016, 1023 (Fed Cir, 1991), cert. denied 502 U.S. 856 (1991). Third, the prior art reference or combination of references must teach or suggest all of the limitations of the claims. *In re Wilson*, 165 USPQ 494, 496, (CCPA 1970).

Applicants' invention relates to a method that involves polishing a composite

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material containing silica and silicon nitride with an acidic polishing slurry comprising: (a) from about 0.1 to about 3.5% , by weight, of a colloidal silica abrasive, (b) from about 1 to about 6%, by weight, of a fluoride salt, and (c) wherein if the slurry has a temperature of 22 °C, the slurry has a pH ranging from about 2 to about 6.

EP 1077241 (EP '241) teaches methods for making a slurry that is suitable for use in a chemical-mechanical planarization process. (See Abstract) Such methods involve combining (a) abrasive particles, (b) a suspension medium, (c) a peroxygen compound, (d) an etching agent, and (e) an alkyl ammonium hydroxide. (See Abstract).

One of ordinary skill in the art following the teachings of EP' 241 would not have been motivated to modify EP' 241 and practice Applicants' invention. EP 241's method of combining (a) abrasive particles, (b) a suspension medium, (c) a peroxygen compound, (d) an etching agent, and (e) an alkyl ammonium hydroxide would not have motivated one of ordinary skill in the art to modify such a method (or any of the other teachings found in EP 1077241, and practice the claimed invention.

EP '241 does not mention any pH value which means the reference lacks meaningful details required under 35 USC 103. Further, the document does not contain teachings for a method which comprises an acidic polishing process in particular, let alone Applicants' claimed process. EP '241 teaches to use an alkaline polishing material (on page 4 lines 37 ff) as the preferred polishing material (pH greater than 7). Further, EP '241 does not contain teachings that are suggestive of the other limitations of Applicants' claimed invention. EP' 241, in other words, does not contain teachings that would have motivated one of ordinary skill in the art to practice Applicants' invention. Reconsideration is requested.

Applicants' invention is non-obvious for the above-mentioned reasons. Applicants' invention, however, is further non-obvious, because Applicants' have shown unexpected advantages of using their acidic polishing material in Examples 1 to 4 (with a pH value of 3.8 and 5) in comparison to the known polishing slurry with a pH of 11.2. The basic polishing material results in poorer polishing rate and polishing selectivity (see page 8 of the specification). Reconsideration is requested.

EP '241, in other words, does not obviate Applicants' invention. EP '241, coupled with the knowledge generally available in the art at the time of the invention,

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does not contain some suggestion or incentive that would have motivated the skilled artisan to modify the inventions taught in the reference as alleged by the Office Action. The proposed modification does not have a reasonable expectation of success, as determined from the vantage point of one of ordinary skill in the art at the time the invention was made. And EP '241 does not teach or suggest all of the limitations of the claims. Reconsideration is requested.

With respect to Misra, the rejection should also be withdrawn for similar reasons. Misra teaches a method for making a slurry composition suitable for use in a chemical-mechanical planarization process. The Misra method involves combining (a) abrasive particles; (b) a suspension medium; (c) a peroxygen compound; (d) an etching agent; and (e) an alkyl ammonium hydroxide. (See Summary of Invention). In another embodiment, Misra teaches a method for making a composition that is suitable for use in a chemical-mechanical planarization process where an abrasive planarizing surface is used. This method involves combining (a) a peroxygen compound; (b) an etching agent; and (c) an alkyl ammonium hydroxide.

Misra does not contain teachings as required under 35 USC 103. Misra does not teach using fluoride salts in particular nor a specific pH range or value as Applicants' invention. In other words, Misra's method for making a slurry composition suitable for use in a chemical-mechanical planarization process by combining (a) abrasive particles; (b) a suspension medium; (c) a peroxygen compound; (d) an etching agent; and (e) an alkyl ammonium hydroxide would not have motivated one of ordinary skill in the art following EP '241 to modify EP '241's methods for making a slurry that is suitable for use in a chemical-mechanical planarization process (or the other teachings) and arrive at Applicants' invention. Reconsideration is requested.

B. Rejection of Claims 10-15 under 35 USC 103 over WO 01/78116 in view of Misra and Ina et al.

The Office Action rejected Claims 10-15 under 35 USC 103 over WO 01/78116 in view of Misra and Ina et al.

Applicants' invention relates to a method that involves polishing a composite material containing silica and silicon nitride with an acidic polishing slurry comprising: (a) from about 0.1 to about 3.5% , by weight, of a colloidal silica

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abrasive, (b) from about 1 to about 6%, by weight, of a fluoride salt, and (c) wherein if the slurry has a temperature of 22 °C, the slurry has a pH ranging from about 2 to about 6.

WO 01/78116, singly or in combination with Misra, would not have motivated one of ordinary skill in the art to modify the taught inventions and practice the claimed processes. The teachings of WO 01/78116 are not broader than the teachings of EP '241, and as such fail for the same reasons that Misra fails. The document teaches applying only strong basic (pH from 9 to 12) polishing slurry is applied (see examples 1 and 2 on page 10 lines 12 and 29: pH 9 – 11.5; Examples 3 and 4 on page 11 line 23: pH 11 – 12). The lower pH range of 2 -6 is only mentioned in connection with the polishing of metals (page 11). Such teachings are not suggestive of Applicants' invention.

Misra does not overcome the deficiencies of WO 01/78116. As indicated above, Misra teaches a method for making a slurry composition suitable for use in a chemical-mechanical planarization process. The Misra method involves combining (a) abrasive particles; (b) a suspension medium; (c) a peroxygen compound; (d) an etching agent; and (e) an alkyl ammonium hydroxide. (See Summary of Invention). In another embodiment, Misra teaches a method for making a composition that is suitable for use in a chemical-mechanical planarization process where an abrasive planarizing surface is used. This method involves combining (a) a peroxygen compound; (b) an etching agent; and (c) an alkyl ammonium hydroxide.

Such teachings would not have motivated one of ordinary skill in the art following WO 01/78116 to modify the claimed process and practice Applicants' invention. WO 01/78116, singly or in combination with Misra, coupled with the knowledge generally available in the art at the time of the invention, does not contain some suggestion or incentive that would have motivated the skilled artisan to modify the inventions taught in the reference as alleged by the Office Action. The proposed modification does not have a reasonable expectation of success, as determined from the vantage point of one of ordinary skill in the art at the time the invention was made. And WO 01/78116, singly or in combination with Misra, does not teach or suggest all of the limitations of the claims. Reconsideration is requested.

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C. Rejection of Claims 10-15 under 35 USC 103 over U.S. Pat. No. 5,759,917 (Grover), alone or in combination with Mirsa and Ina.

The Office Action rejected Claims 10-15 under 35 USC 103 over Grover, alone or in combination with Mirsa and U.S. Pat. No. 6,315,803 (Ina). The rejection should be withdrawn. Grover, singly or in combination with Mirsa and Ina, is not suggestive of Applicants' invention.

Applicants' invention relates to a method that involves polishing a composite material containing silica and silicon nitride with an acidic polishing slurry comprising (a) from about 0.1 to about 3.5% , by weight, of a colloidal silica abrasive, (b) from about 1 to about 6%, by weight, of a fluoride salt, and (c) wherein if the slurry has a temperature of 22 °C, the slurry has a pH ranging from about 2 to about 6.

Grover teaches a chemical mechanical polishing composition comprising carboxylic acid, a salt and a soluble cerium compound at a pH above 3 and a method to selectively polish a silicon oxide overfill in preference to a silicon nitride film layer in a single step during the manufacture of integrated circuits and semiconductors. (See Abstract).

Misra teaches a method for making a slurry composition suitable for use in a chemical-mechanical planarization process. The Misra method involves combining (a) abrasive particles; (b) a suspension medium; (c) a peroxygen compound; (d) an etching agent; and (e) an alkyl ammonium hydroxide. (See Summary of Invention). In another embodiment, Misra teaches a method for making a composition that is suitable for use in a chemical-mechanical planarization process where an abrasive planarizing surface is used. This method involves combining (a) a peroxygen compound; (b) an etching agent; and (c) an alkyl ammonium hydroxide.

Ina teaches an invention whose principal purpose is to provide a polishing composition which is capable of polishing a tantalum-containing compound at a high stock removal rate and whereby the copper surface after polishing is scarcely corroded, and to provide a polishing process where dishing can be minimized. (See Abstract). Ina teaches that a means to accomplish the object includes a polishing composition comprising an abrasive, oxalic acid, an ethylenediamine derivative, a

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benzotriazole derivative and water and not containing an oxidizing agent, and a polishing composition comprising an abrasive, oxalic acid, an ethylenediamine derivative, a benzotriazole derivative, water and hydrogen peroxide. Further, Ina teaches a polishing process for forming a copper printed wiring, which is a polishing process for a semiconductor device and which comprises a first polishing step wherein polishing is completed immediately before reaching a barrier layer while a copper layer still slightly remains, and second and third polishing steps wherein the remaining copper layer and the barrier layer are polished, wherein in the second polishing step, a polishing composition containing hydrogen peroxide is used and all the copper layer to be removed, is removed by polishing, and then, in the third polishing step, a polishing composition not containing hydrogen peroxide is used and all the barrier layer to be removed, is removed by polishing.

Grover, singly or in combination with Mirsa and/or Ina would not have been motivated to make Applicants' invention. Grover neither teaches to use a fluoride salt in particular nor teaches applying to a lower pH value of 2 to 6. Grover does would not have provided more information to one of ordinary skill in the art than EP 241, the Mirsa or the WO '116 documents. Indeed, neither Mirsa nor Ina contain teachings that would have motivated one of ordinary skill in the art following the teachings of Grover to modify Grover and practice Applicants' invention. Reconsideration is requested.

D. Rejected Claims 10-15 under 35 USC 103 over U.S. Pat. No. 6,350,393 (Francis) in view of Mirsa

The Office Action rejected Claims 10-15 under 35 USC 103 over U.S. Pat. No. 6,350,393 (Francis) in view of Mirsa. The rejection should be withdrawn.

Applicants' invention relates to a method that involves polishing a composite material containing silica and silicon nitride with an acidic polishing slurry comprising: (a) from about 0.1 to about 3.5% , by weight, of a colloidal silica abrasive, (b) from about 1 to about 6%, by weight, of a fluoride salt, and (c) wherein if the slurry has a temperature of 22 °C, the slurry has a pH ranging from about 2 to about 6.

Francis teaches a chemical mechanical polishing composition comprising fumed silica and from about 0.01 to about 5.0 wt % of at least one Cs⁺ basic salt.

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(See Summary of Invention). Francis teaches that in one embodiment its invention is a chemical mechanical polishing composition comprising water, from about 1 to about 50 wt % fumed silica, and from about 0.1 to about 2.0 wt % CsOH. The polishing composition planarizes a silicon containing substrate with an open field efficiency of at least 50% and with an array field efficiency of at least 85%. Francis teaches that in yet another embodiment, its invention is a chemical mechanical polishing composition capable of polishing integrated circuits having gate widths less than about 0.25 microns comprising from about 1 to about 50 wt % of a metal oxide abrasive and from about 0.01 to about 5.0 wt % Cs+ basic salt. Further, Francis teaches that in still another embodiment, its invention is a method for planarizing an insulating layer with a polishing composition of this invention. The polishing is achieved by preparing a polishing composition comprising water and CsOH. The polishing composition is then applied to a surface of the substrate being planarized or to the polishing pad. The polishing pad is brought into contact with the surface of the silicon containing substrate layer being planarized, and the pad is moved in relation to the silicon containing substrate surface being planarized. An abrasive is used in conjunction with the polishing composition to facilitate polishing. The abrasive may be associated with the polishing pad or the abrasive may be added to the polishing composition to give a chemical mechanical polishing slurry before the slurry is applied to the substrate or to the polishing pad.

Such teachings are not suggestive of Applicants' invention. Francis, singly or in combination with Misra, simply is not suggestive of Applicants' invention. Francis does not teach about the acidic pH range, as now claimed by Applicants' invention. Francis is not suggestive of the other limitations in Applicants' claimed process. Reconsideration is requested.

Misra fails to overcome the deficiencies of Francis. Misra's method for making a slurry composition suitable for use in a chemical-mechanical planarization process would not have motivated one of ordinary skill in the art following the teachings of Francis to planarize a silicon containing substrate with an open field efficiency of at least 50% and with an array field efficiency of at least 85% with its composition and arrive at Applicants' invention. The other combined teachings of Misra and Francis fail to provide the requisite suggestion.

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Francis, singly or in combination with Misra, coupled with the knowledge generally available in the art at the time of the invention, does not contain some suggestion or incentive that would have motivated the skilled artisan to modify the inventions taught in the reference as alleged by the Office Action. The proposed modification does not have a reasonable expectation of success, as determined from the vantage point of one of ordinary skill in the art at the time the invention was made. And the Francis, singly or in combination with Misra, does not teach or suggest all of the limitations of the claims.

In view of the foregoing amendments and remarks, allowance of the pending claims is earnestly requested.

Respectfully submitted,

By



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